

Network Lifecycle Management

**A solution approach to managing networks:
A perspective by EMA**

A White Paper Prepared for Hewlett-Packard
June 2007



Table of Contents

- Introduction 1
- Challenges Facing Network Engineering and Operations Teams 1
 - Scale and Complexity Drives the Need for Intelligent Automation 1
 - Change is Constant 2
- A Best Practice Approach 2
 - HP's Approach: Network Lifecycle Management 3
 - Plan Networks to Meet Business Requirements 3
 - Deliver Networks to Support Services and Applications 4
 - Operate Networks to Meet SLAs and Financial Goals 4
- EMA's Perspective 6
- About Hewlett-Packard 6

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

Introduction

Today, business priorities are driving the operational requirements for Network Operations teams. As business becomes more and more embodied in technology, IT has an ever increasing role in supporting the essential business requirements of managing liability and risk, maximizing revenue and minimizing expense. For network engineering and operations teams, translating those business requirements into operational requirements entails:

- Minimizing liability and risk associated with the network (e.g. network compliance and security),
- Maximizing network availability and performance (i.e., to ensure maximum availability of revenue generating applications), and
- Optimizing resource utilization for both IT staff and assets.

All of this places additional emphasis on the need for management systems that support managing the network at a business process level. As a result, the management marketplace is now at a tipping point, as IT organizations begin to adopt more progressive approaches to managing the delivery of IT services to their customers. Network management, rather than being an island peripheral to these changes, resides at the center of the storm, as it is in many respects the networked infrastructure where cross-domain insights and advanced automation come together.

This paper focuses on how network engineering and operations teams can achieve these operational objectives. It begins with a review of some of the challenges and hurdles blocking these objectives. Then it provides a discussion of best practice approaches aimed at achieving these objectives. And finally, it provides a review and analysis of HP's Network Lifecycle Management (NLM) solution, which is specifically designed to enable network engineering and operations teams to achieve these objectives.

Challenges Facing Network Engineering and Operations Teams

Scale and Complexity Drives the Need for Intelligent Automation

As businesses open up their networks to the outside world through eCommerce, web-enabled customer service, intranets with partners, etc., they also expose them to increased risk. With government regulations like SOX,

HIPPA, PCI, GLBA, etc., IT must not only ensure that every device and interface is compliant and secure, but also provide documentation for periodic compliance audits. This adds several orders of magnitude of complexity to network operation's responsibilities for security and compliance. It's no longer a question of if – the stakes of financial penalties and company reputation are too high – it's really a question of how. With vast and complex networks, how can network operations teams ensure every device and interface is compliant and secure? How fast can network operations teams react to new security threats?

Furthermore, it's no longer sufficient to say that the business depends on the network – in reality, with the proliferation of web applications and IP based communications, it's really that the business is embodied in the network. When the network isn't working, company financials are impacted – either revenue generating activities are impacted and/or opportunity costs rise. Here the vastness and complexity of today's networks makes it a challenge to ensure that every cable, interface, switch, router, VLAN, routing protocol, link speed, or configuration, is available and performing correctly. In addition, the network is affected by groups and services outside of the control of network operations. So when an application team moves an application to a new site or over an ocean, or when a service provider link speed is cut, or when someone changes a network device configuration over the weekend, network performance may unexpectedly degrade, impacting business performance.

Finally, companies have big investments in their networks, but few people to manage them. And those few people are responsible for both maximizing Return on IT Assets and providing a lowest cost operational service. This means they need to optimize network capacity and utilization while running a lean operation. But with the scale, complexity and pace of change of their networks, they can't afford, or keep up with, manual processes at any level. For example, when operators are forced to scroll through thousands of events, or swivel between management tools that lack integrations, or manually conduct capacity planning, or focus their time on lower priority issues because they lack a business or service view of their network, costs are incurred and backlogs grow. Furthermore, when network management software doesn't scale or cover multi-vendor networks, network operations teams must spend time and budget on extra management systems and vendors.

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

Change is Constant

There are big changes in IT today. Advances in technology such as the virtualization of networking (e.g., VLANs, virtualized routing services), mergers and acquisitions, and big projects like IP telephony and/or data center consolidation, are just a few examples that are driving changes in the network. Network operations teams are challenged with ensuring business continuity in parallel with these changes.

Most IT organizations are buried under an unmanageable number of changes due to the scale and complexity of their networks. For example, a large financial institution supported through EMA consulting estimated that, including moves and adds, they experienced as many as 20,000 changes a week. Compounding the challenges inherent with a large volume of change, many IT organizations are also burdened by stove-piped organizational structures with minimal resource for process and documentation, or even time for the effective sharing of data among closely related professionals. When IT professionals develop their own personal solutions, e.g., individualized approaches for generating scripts, there is little or no potential for automation because device-brand specific expertise doesn't scale to large, complex environments. All this is a setup for human error and slow deployments.

Also, the increased infrastructure density and frequency of change increases the challenge of change management creating an environment so complex that a simple configuration error can cause cascading failures across the entire infrastructure. In one IT environment EMA documented that eight out of ten changes to the network required other changes to be made, and 10% of the time, these resulted in catastrophic failures.

Whether the issue is maximizing compliance, security, service availability, or the efficiency of IT staff and assets, network operations teams are tasked with managing a moving target. The network is always changing and evolving as new technologies and applications are being brought to bear to solve new problems or to provide better solutions to old problems. Each change and evolutionary cycle has its own lifecycle. Successful operations teams learn how to master these lifecycles, and that means embracing not only new technologies, but addressing the need for new, more collaborative approaches to managing services as a cohesive organization.

The IT community has responded to the challenge of managing vast, complex, and changing networks with best practices such as the Information Technology Infrastructure Library (ITIL), Control Objectives for Information and related Technology (COBIT), Six Sigma, Capability Maturity Model (CMM), etc. There is also a growing community of vendors offering configuration management database (CMDB) system solutions, that can form a foundation for integrating virtually all IT disciplines from change management to asset management, to capacity planning, to incident and problem management, to service level management and business impact management.

The integration of asset management, configuration management, and capacity planning can bring dramatic benefits in terms of both capex and opex savings. Some of the opex efficiencies are highlighted in the call-out box below.

EMA has seen dramatic operational efficiency gains from multi-vendor capabilities for network configuration management when integrated with other services management capabilities:

- Changes implemented per hour increased from 20 manually to 10,000 with strong network configuration tools.
- While EMA research data shows that as much as 60% of all availability and performance issues are caused by ineffective configuration, EMA has seen configuration errors reduced from 90% of those impacting service to as low as 10% or less when strong network configuration capabilities such as NCM are deployed.
- The time to assess the impact of change upon the network can be reduced by as much as from four hours to five minutes.
- IT organizations can begin to adopt more uniform processes for managing change as a result of these investments, as tools such as NCM enable processes to be stabilized, defined and shared across the IT organization. The benefits of this consistency combined with high levels of automation are enormous.

A Best Practice Approach

Integrating management tools is just the beginning, how-

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

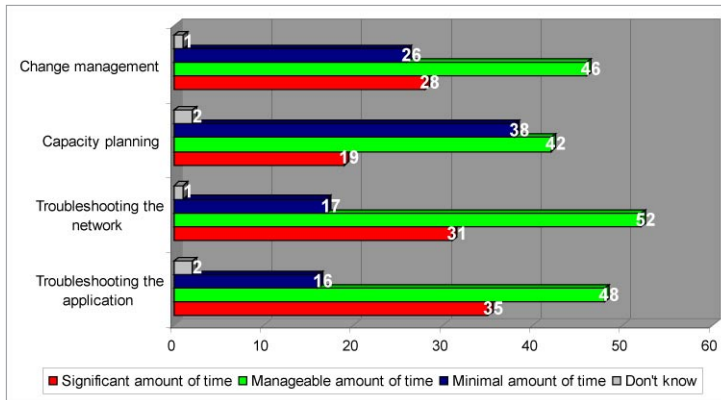


Figure 1: Time spent in addressing critical network management and planning tasks from Q4, 2006 EMA research

ever. The network can be thought of as an instrumented ocean over which all critical business services must traverse. It can provide telling insights into where and how problems are occurring, not just with the network, but with the application traffic flowing over it, and even in many cases inform on systems and data center performance as an extended constituent of the larger networked infrastructure. Depending on organization and heritage, some IT environments are successfully focusing their efforts to create a single pane of glass across all their services and infrastructure through the NOC, where the tradition of managing to interdependencies is most established and most mature.

In Q4 2006, EMA did research on the time spent on critical tasks in managing application performance across the network. The data shows (Figure 1) troubleshooting applications came in first and troubleshooting the network second, leading to the conclusion that network management tools must also provide some insight into application troubleshooting.

Finally, managing the network with all of its interdependencies for business alignment as a best practice means optimizing service performance based on business value. For instance, certain application services such as order entry may be more business critical than others such as e-mail. Similarly, application response time for certain applications may experience predictably high volumes on certain days of the week or hours of the day, placing differing dynamic demands on the network and the rest of the infrastructure. In order to ensure that IT service quality matches the changing needs of the business, network operations teams must adopt an approach that en-

ables them to synchronize the evolution of the network with the evolution of the business; i.e., manage the lifecycle of network development quickly, effectively and efficiently to keep pace with changing business pressures.

HP's Approach: Network Lifecycle Management

To address the objectives of minimizing liability and risk, maximizing network availability and performance, optimizing resource utilization and managing change, HP provides a complete network lifecycle management solution. NLM is a solution that provides automation across the lifecycle of **Plan, Deliver, and Operate**. It's based on an ITIL model and integrates with

HP's service management solutions. Through this combination of capabilities, HP helps to break down traditional IT silos and functions, working across strategy, planning, service desk, change management, application support and other IT organizations.

Typical use cases for NLM include rolling out IP telephony or working through a data center consolidation project. HP provides capabilities to **Plan** for those changes including network design, simulation and modeling capabilities; capabilities to **Deliver** those designs to the network such as configuring the network for QoS with automated network change and configuration management; and capabilities to **Operate** the network and ensure its desired state is maintained including service and business impact operational views.

Plan Networks to Meet Business Requirements

Plan is the first phase of network lifecycle management. The high-level goal of the planning phase is to design an end-state for the network that will support all of the required business services at optimal levels of availability and performance. Effective planning reduces business risk and expense while maximizing project success. Common tasks of the planning phase include network topology analysis, network layout and design, network configuration standards and policy determination, and network change simulation and modeling.

HP provides several automated capabilities to enable ef-

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

efficient and accurate network planning. These capabilities include the following:

- *Automated design workspace for network layout and configuration.* This feature provides a technical canvas for network layout and design. It can be used for planning minor changes like bare-metal provisioning a new WAN router, or for planning major changes such as designing the network backbone for a data center consolidation project.
- *Network configuration standards and policies library.* This feature provides an automated and centralized document management system for network configuration standards and policies. For example, it can be used to design and manage on an ongoing basis network security and compliance policies. This capability is extremely flexible and modular such that new security templates can be defined quickly to respond to new threats and vulnerabilities (e.g., US CERT advisories).
- *Network change simulation and modeling engine including traffic analysis.* HP's WAN optimization capabilities integrate real-time routing information with traffic-flow data to provide a topology-aware view of network traffic. These capabilities can be used to analyze the effects of network changes for both infrastructure and traffic. For example, both the effects of adding a router and adding VoIP traffic to a network can be modeled. These capabilities validate WAN links are optimized.
- *Network capacity planning, trending and forecasting* – HP's network performance management capabilities support planning functions by providing accurate performance and capacity baselines to network engineers and operators.

Deliver Networks to Support Services and Applications

The delivery phase is about delivering or building the network once the designs are complete. Depending on the project, the delivery phase may consist of numerous tasks. For example, delivering QoS settings to support VoIP to every device and interface across a network may involve thousands of tasks. Thus, automation is a necessity in the delivery phase to ensure cost efficiency and accuracy.

Again, HP provides several automated capabilities to

ensure the successful and efficient delivery of network designs. These capabilities include the following:

- *Cross IT change collision analysis.* HP provides automated capabilities for analyzing change across IT from a consolidated platform. This ensures, for example, that network engineering and operations teams are aware when applications teams are planning a major application move or startup.
- *Cross domain change management capabilities.* This ensures successful cross domain coordination and management of change – especially when tasks are owned by multiple IT groups.
- *Automated network change and configuration.* HP provides a number of capabilities for managing network change and configuration including: job scheduling, workflow approval, pre-configuration compliance and policy testing, and automated roll-back capabilities.
- *Real-time validation of changes through WAN optimization.* With HP's real-time WAN optimization capabilities, the success and effectiveness of network changes can be monitored immediately after they are delivered to validate accuracy and operational expectations.

Operate Networks to Meet SLAs and Financial Goals

The **Operate** phase is the final phase in network lifecycle management. The main goal of the Operate phase is to ensure the desired state of the network, and the services and applications that it supports, are continuously maintained. With today's IT systems, this can be a multi-dimensional problem. For example, it's entirely possible that a set of routers are up and running, but improperly routing traffic. Thus, it's not enough to manage availability and performance of those routers; insight into the routing service is required as well. Furthermore, to ensure efficiency and success across IT, it's imperative to connect IT systems (e.g. the network) to the applications, services and business processes which they support. It's possible for multiple things to go wrong at the same time, so by understanding business and IT dependencies, IT can utilize their resources in alignment with business priorities. Finally, ensuring the desired state means combining a proactive fault-prevention approach with traditional reactive approaches to network management.

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

HP offers a complete set of capabilities for ensuring that the desired state of the network is maintained. These capabilities include the following:

- *Incident and problem management.* HP's network lifecycle management solution is integrated with its IT service management solutions to provide process automation to network operations teams.
- *Service driven operations management.* With HP's consolidated operations console, IT infrastructure, including networking infrastructure, can be linked to the applications and services they support enabling business-impact/priority based management.
- *Consolidated/cross-domain event management.* HP offers a robust event consolidation platform for managing events from systems across IT (e.g. applications, systems and networks). This platform includes advanced event management capabilities such as event lifecycle management and operator assignments.
- *Extensible and intelligent network fault and availability management with real-time dynamic root cause analysis.* HP's automated root cause analysis capabilities utilize a dynamic approach to solving network faults. They combine advanced event correlation and analysis with targeted, dynamic polling to quickly locate the root cause of network failures across the physical, logical, and virtual network infrastructure. This can be achieved in real-time in combination with HP's WAN optimization capabilities.
- *Repair faults with automated configuration management.* In addition to detecting and locating service disrupting network faults, HP is able to automatically repair most of those faults with their network change and configuration management capabilities.
- *Continuous assurance of network configuration standards and policies.* This capability offers fault prevention through automated network change and configuration management. Furthermore, it enables continuous assurance of compliance and security policies. A feature of this capability includes automated detection and remediation of non-compliant devices.
- *Network performance management.* HP's network performance management solution is another component of HP's fault-prevention capabilities. Through trending and forecasting, HP's network performance management solution is able to detect negative trends before they result in service disruptions.
- *Real-time Layer 3 WAN optimization management.* HP's route analytics capabilities provide real-time visibility into the actual path of application

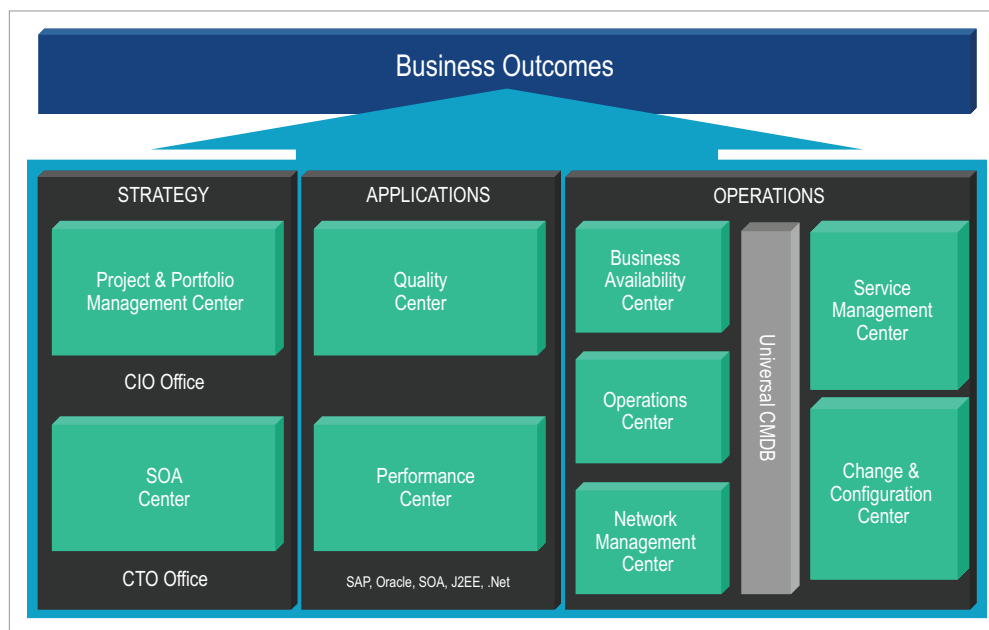


Figure 2 HP's Network Management Center in context with HP's broader management portfolio

Network Lifecycle Management

A solution approach to managing networks: A perspective by EMA

traffic flows across the network, and therefore give network engineers real-time awareness and visibility into routing changes and failures. This provides important diagnostics for otherwise hard-to-find IP layer (Layer 3) routing problems. Some examples might include routing instabilities, router adjacency loss, configuration errors, imbalanced network exists, asymmetric link diagnostics, route flapping and interface flapping. Further, as application problems are being diagnosed, knowing the path the application is *actually* taking can be critical to fast resolution.

EMA's Perspective

As should be clear from the above, HP's arsenal of capabilities associated with network lifecycle management is both distinctive and compelling. HP has not only made significant investments into unifying and advancing its core strengths in Network Node Manager and Performance Insight, but has also invested in two of the most exciting technologies in network management today: route analytics and network configuration management. HP has placed and continues to place significant resources into the further integration between network configuration and areas such as help desk support, asset management, and CMDB support to enable yet further levels of integration. These will eventually support such requirements as multi-domain provisioning and integrated compliance and security analysis.

HP's network lifecycle approach as a way of conveying and clarifying the strengths of its portfolio is also distinctive. EMA believes that HP's guidance in targeting the steps of "plan, deliver, operate" will help its customers optimize its portfolio strengths, not least of all because of the concordance of these ideas with ITIL V3 for more strategic process planning. This approach also tends to highlight HP's strengths in configuration management and route analytics.

If there is a single weakness to date in HP's network management capabilities, it remains complexity. While HP has arguably the most advanced set of network management technologies in the industry to date bar none, making full use of its portfolio does require administrative and service investment. This complexity is further aggravated by the fact that both RAMS and Network Configuration Manager are OEM solutions.

However, EMA is impressed with HP's forethought and initiative in carving out a cohesive set of network management capabilities that fit well and knowingly into a broader set of offerings. HP also has the breadth and depth of service, support and process expertise to make its Network Management Center perhaps the single most compelling set of network management options to date for IT organizations with complex, heterogeneous network management challenges.

About Hewlett-Packard

HP is a technology solutions provider to consumers, businesses and institutions globally. The company's offerings span IT infrastructure, global services, business and home computing, and imaging and printing. More information about HP (NYSE: HPQ) is available at <http://www.hp.com>. For more on HP's Storage Essentials and Storage Resource Management, see <http://www.hp.com/go/SRM>.

About Enterprise Management Associates, Inc.

Enterprise Management Associates is an advisory and research firm providing market insight to solution providers and technology guidance to Fortune 1000 companies. The EMA team is composed of industry respected analysts who deliver strategic awareness about computing and communications infrastructure. Coupling this team of experts with an ever-expanding knowledge repository gives EMA clients an unparalleled advantage against their competition. The firm has published hundreds of articles and books on technology management topics and is frequently requested to share their observations at management forums worldwide.

This report in whole or in part may not be duplicated, reproduced, stored in a retrieval system or retransmitted without prior written permission of Enterprise Management Associates, Inc. All opinions and estimates herein constitute our judgement as of this date and are subject to change without notice. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

©2007 Enterprise Management Associates, Inc. All Rights Reserved.

Corporate Headquarters:

5777 Central Avenue, Suite 105

Boulder, CO 80301

Phone: +1 303.543.9500

Fax: +1 303.543.7687

www.enterprisemanagement.com

